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AUTHOR Shaughnessy, Michael F.; Reif, Laurie
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ABSTRACT

Three experiments were conducted in order to clarify the encoding/retrieval dilemma in older adult students; and the recognition/recall test issue was also explored. First, a mnemonic technique based on the "key word" method of Funk and Tarshis was used; secondly, a semantic processing task was tried; and lastly, a repetition task, based primarily on the work of Nelson was used. Two forms of tests were also used in the third experiment, a basic multiple choice test and a free recall test. The material to be learned was vocabulary words chosen from Funk and Tarshis and used in other vocabulary learning experiments. An average of about 65 students, with group mean ages in the late 30s-early 40s, was used in the experiments. The results of the three experiments showed that older adults, when left to their own tried and true past memory devices, will outperform those using other novel mnemonic and semantic processing strategies and far surpass those using rote repetition strategies. The experiments also showed that even when given later cues to enhance recall, the memory trace of older adult students appears to decay rapidly in spite of later review-retrieval assistance. Finally, the experiments showed that mnemonic devices appear slightly better than semantic processing devices, and repetition does not appear to facilitate processing in older adult students. Further, recognition tests, rather than recall tests that restate the original learning context, appear to be most facilitative of recall. (KC)

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An Investigation of Differential Encoding and Retrieval in Older Adult College Students

Michael F. Shaughnessy

and

Laurie Reif

Eastern New Mexico University

Psychology Department

Portales, New Mexico 88130

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Abstract

Aging, memory and learning have been tangentially addressed by educational psychologists, but specific issues such as encoding and retrieval have not, as yet, been experimentally addressed. Three experiments were conducted in order to clarify the encoding/retrieval dilemma in older adult students and the recognition/recall test issue was also explored. Results of this research are examined and implications for older adult learners are explored.

How can we best help older adult students learn? The question is simple, but the issue is complex. Typically memory has been seen to decline with age. This simplistic view does not take into account a host of factors. These factors could include a lack of attention, lack of mental energy, or lack of interest.

Eysenck (1974, 1977) has indicated that a processing deficit may be responsible for age differences in memory performance. This posture holds that "deeper" processes demand more effort and attention, and older subjects essentially do not perform these operations efficiently and this results in poor memory performance. Craik (1977) however, has hypothesized that the older person's processing skills are inefficient, not defective, and indicates that if processing could be guided by an orienting task, that the older person's memory lack might be ameliorated.

Research by White (described by Craik, 1977) found results supporting Eysenck's position. However, a later recognition test failed to find age decrement but in the free learning condition, an age decrement was manifested. This aspect seems to support Craik's ideas.

Craik and Byrd (1982) have proposed that older people may simply be "inefficient at both encoding and retrieval processing." Thus, older subjects may be encoding material in the "same old way" that they did when they were younger. They do not actively use imagery, associations or mnemonic techniques. How then, can encoding and retrieval be ameliorated for the older student? Jenkins (1979) indicates that overall performance must be seen as a multiple set of interactions between the subjects,

the materials utilized and the task/goal specified by the experimenter. Thus, in order to minimize age-related losses in memory we must utilize

> highly meaningful materials, an encoding task that induces semantic processing of these materials and a retrieval test that reinstates the original learning context (Jenkins, 1979, p. 194).

The idea of providing retrieval assistance has been recently investigated by Perlmutter and Mitchell (1982). Furthermore, by directing encoding processes, memory in older adults appears to be enhanced.

The "failure of retrieval" position has been argued by Schonfield and Robertson (1966). In their study two lists of 24 words were presented on a screen to subjects ranging in age from their twenties to their sixties. The participants were required to recall words from one list and to recognize words from the other. Essentially recall scores declined significantly with age. However, there was no change in recognition scores. Schonfield and Robertson hypothesize that age deficits are due more to problems in the retrieval process and not in encoding or acquisition.

In order to address the three aforementioned issues, i.e., encoding, retrieval, and retrieval testing which reinstates the original learning context, three experiments were conducted. In general, three encoding processing methodologies were utilized. First, a mnemonic technique based on the "key word" method of Funk and Tarshis

(1955),secondly, a semantic processing task and lastly a repetition task, based primarily on the work of Nelson (1977). Two forms of tests were also utilized in the third experiment. A basic multiple choice test was used and a free recall test was used in the third experiment. The free-recall test was constructed so as to "reinstate the original learning context" and thus facilitate recall. The to-be-learned material was vocabulary words chosen from Funk and Tarshis and utilized in other vocabulary learning experiments (Shaughnessy and Cockrell, 1983).

Experiment 1

Method:

Subjects and setting: 80 students (volunteers from university classes who were above the chronological age of 35) participated in this experiment. The mean age of the subjects was 41.5. All testing took place in regular university classrooms during afternoon hours.

Materials: Twenty words were utilized as the to-be-learned materials.

Procedure: The subjects were given the words to be learned and were given twenty minutes to comply with the directions. The mnemonic group simply had to study the word, its word link and the sentence wherein the word link was utilized. The semantic group was required to use the to-be-learned word in a sentence and the repetition group was asked to write the word and its definition 10 times.

Results and discussion: Results were analyzed utilizing analysis of variance (ANOVA) procedure. Significance was reached, $F(3, 76) = 7.51 < .05$. Means and standard deviations for the four groups are shown below.

Table 1

	A	B	C	D
Means	17.8	17.5	13.8	18.9
S. D.	3.6	3.2	4.9	1.9
n	20	20	20	20

As can be seen, the mnemonic treatment and the semantic processing treatment appeared to be more effective than rote repetitive learning. However, the superior performance of the control group requires examination. Obviously, these adult learners employed strategies which have been effective for them over several years.

In order to attempt to control for this problem area, and in order to ascertain the facilitative effects of review via a cueing methodology a second experiment was conducted.

Experiment 2

Method:

Subjects and setting: 60 student volunteers from university classes who were above the chronological age of 30 participated in the second experiment. The mean age of this group was 39.3. All testing took place in regular university classrooms during afternoon hours.

Materials and procedures: The subjects were given the to-be-learned words and were given twenty minutes to follow the directions specific to their treatment condition. The directions were the same as in experiment one. However, there was no control group. At the end of the twenty minute study period, the subjects were given a five minutes break. At the end of that time, subjects were given review materials relevant to their treatment condition. The mnemonic group reviewed their twenty words, the semantic group rewrote the 20 words in sentences and the repetition group rewrote the definition once. The subjects were then given IBM sheets and tested over the twenty words. The sheets were machine scored.

Results and Discussion:

Results were analyzed utilizing an analysis of variance (ANOVA) procedure. There was no significant difference between the three groups. Means and standard deviations are shown below:

Table 2

	A	B	C
Means	12.5	13.4	12.8
S. D.	5.7	4.5	4.5
n	20	20	20

The results of the second experiment, at first perplexing in contrast to the results of Experiment 1, later became clear from a non-processing perspective. Although the experimenters had hypothesized that the later review

would enhance recall, what was not taken into account was the consideration that the to-be-learned material would "decay" during the break and that the retrieval "cues" would not be sufficiently potent to enhance recall. Thus, in addition to the encoding/retrieval paradigmatic problems mentioned earlier, another pedagogical or memory concern may be of importance, i.e., that of "decay." Thus, periodic review may serve to prevent decay, or review as soon after learning as possible may further enhance recall. Although these hypotheses were seen as plausible and worthy of further investigation, the third experiment was then conducted to investigate the "restatement of original learning context" position in the hope that the results would shed some light on this area.

Experiment 3

Method:

Subjects and setting: 57 student volunteers from university classes who were above the chronological age of 30 participated in the third experiment. The mean age of this group was 38.3. All testing took place in regular university classrooms during afternoon hours.

Procedure:

The subjects were given the words to be learned and were again given 20 minutes to comply with directions. The directions were the same as in Experiments 1 and 2. At the end of the twenty minute period, however, two tests were then given in counter-balanced fashion. The first test was

recognition (multiple choice) in nature, whereas the second test restated the original learning context and required the subject to recall and provide the word fitting the definition.

The multiple choice tests were machine scored while the recall tests were scored according to a pre-formulated key. The means and standard deviations for Test 1 (multiple choice-recognition) and for Test 2 (restatement of original learning context-recall) are shown below:

Table 3

Test 1

	A	B	C
Means	15.05	13.52	11.42
S. D.	4.19	5.09	4.45
n	19	19	19

Table 4

Test 2

Means	11.47	9.84	7.31
S. D.	6.9	6.58	4.46
n	19	19	19

Analysis of variance (ANOVA) procedures were conducted on the results of Test 1 and of Test 2. In neither case was there significance at the .05 level of confidence. However, as can be seen, the results of Test 1 are considerably higher than Test 2. In other words, as has been seen ir the

previous literature, recognition is superior to recall. There could, of course, have been a "cueing" effect that may have accounted for this which may bear future examination. Thus, a cue, or review, given immediately after learning may facilitate recall whereas a cue given later, e.g., five minutes, may not facilitate retrieval due to "decay" or loss of the memory trace.

Conclusion:

Overall, the results of the three aforementioned experiments lend creedence to the old aphorism about "teaching an old dog new tricks." The results of the first experiment seem to indicate that, when left to one's own past "tried and true" devices, older adult students will outperform other novel mnemonic and semantic processing strategies and far surpass rote repetition strategies. The second experiment resurrects an old memory concern, i.e., decay. Apparently, even when given later cues to enhance recall, the memory trace of older adult students appears to decay rapidly in spite of later review/retrieval assistance. Experiment 3 re-established a pattern found in other research. That is, mnemonic devices appear slightly better than semantic processing devices, and repetition (for whatever reasons, e.g., ennui, non-distinctiveness) does not appear to facilitate processing in older adult students.

Further, recognition tests, rather than recall tests which restate the original learning context, appear to be most facilitative of recall. Recall appears to require

either more effort (Auble, Franks and Soraci, 1979) or deeper procesing during learning. Perhaps as age increases, a point of diminishing returns is reached or as noted in Experiment 2, decay is operative to a greater extent and later cues may be ineffective.

The present study, of course, can be criticized on several counts, i.e., small sample size (twenty in each group), less than meaningful material (esoteric vocabulary words) and finally, inability to control for the internal processing of the "control" group--a problem in most learning/cognition studies. However, the subjects did comprise 33% of the adult student population of this southwestern university and thus could be considered "representative." Furthermore, as can be seen, sampling procedures did appear to insure approximately equivalent groups, particularly in terms of age.

Implications for older adult students are many. Rehearsal of learned material as soon as possible after learning appears imperative so as to minimize "decay." Adult students preparing for tests would be advised to ascertain test format, i.e., multiple choice or essay, and perhaps invest more time and review in preparing for an essay (recall) test than a recognition (multiple choice) test. This is consistent with the idea of "transfer-appropriate processing" of Bransford and Franks (1971). Mnemonic devices appear to be and still remain the most viable methodology for adult learners. The enhancement of both encod-

ing and retrieval still appears to be an area of much needed research. Further still, the amelioration of retrieval for recall tests appears to be a more specific domain for educational investigations in order to help the adult learner.

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